



Hazy Days

In this lesson, students will learn about haze – how it is formed, what impact it has on human health, and what can be done about it. Students will observe particles floating in the air to assist them in understanding particulate matter that is too small to see with the human eye. Then, through an action game, they will learn how small particles can affect the respiratory system. With this information, students will formulate questions for Internet research. Finally, each student will compose an illustrated story entitled “Hazy Days” to educate the public on issues around haze and air pollution. This is the first in a two-lesson unit on air pollution and visibility. (Environmental Education)

<i>Education Committee</i>	<i>The Clean Air Campaign®</i>	<i>Fulton</i>	<i>EEinGEORGIA.org</i>
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Primary Learning Outcomes

What is haze?

What is particulate matter and where does it come from?

How does particulate matter contribute to air pollution?

How does particulate matter affect health?

What can we do to reduce the health effects of particulate matter?

What can we do to reduce particulate matter?

Additional Learning Outcomes

How can we share information with others in an interesting and informative way?

Assessed GPS Standards:

Grade: 3

Science Standards:

S3L2: Students will recognize the effects of pollution and humans on the environment.

- Explain the effects of pollution (such as littering) to the habitats of plants and animals.
- Identify ways to protect the environment.

- Conservation of resources
- Recycling of materials

Non-Assessed GPS Standards:

Grade: 3

Science Standards:

S3CS5b,d: Students will communicate scientific ideas and activities clearly.

- b. Make sketches to aid in explaining scientific procedures or ideas.
- d. Locate scientific information in reference books, back issues of newspapers and magazines, CD-ROMs, and computer databases.

S3CS4b: Students will use ideas of system, model, change, and scale in exploring scientific and technological matters.

- b. Use geometric figures, number sequences, graphs, diagrams, sketches, number lines, maps, and stories to represent corresponding features of objects, events, and processes in the real world.

S3CS8: Students will understand important features of the process of scientific inquiry. Students will apply the following to inquiry learning practices:

- a. Scientific investigations may take many different forms, including observing what things are like or what is happening somewhere, collecting specimens for analysis, and doing experiments.
- b. Clear and active communication is an essential part of doing science. It enables scientists to inform others about their work, expose their ideas to criticism by other scientists, and stay informed about scientific discoveries around the world.
- c. Scientists use technology to increase their power to observe things and to measure and compare things accurately.
- d. Science involves many different kinds of work and engages men and women of all ages and backgrounds.

Social Studies Standards:***Information Processing Skills***

Procedures/Activities

Step: 1 Duration: Teacher Preparation

Teacher Preparation - Review the Teacher Resource Manual. The Teacher Resource Manual provides background information on the lesson topic and other lesson resources. Review all steps in this lesson prior to beginning so that you will know what to prepare in advance for your class. Be sure to collect all the items listed in the materials section, and to make transparencies and hand-outs (as indicated throughout the lesson) ahead of time. Newspaper balls can be made by wadding up newspapers to the size of a tennis ball and wrapping masking tape once around to hold the shape.

Web Resources for Step 1

Title: Teacher Resource Manual

URL: http://eeingeorgia.org/content/ee/docs/4th_CAC_Manual.doc

Annotation: The Teacher Resource Manual provides background information on the lesson topic and other lesson resources.

Step: 2 Duration: 5 minutes

Show students the attached photo of the Atlanta skyline. The photo can be shown as a transparency master or color copies can be passed out to students (the picture is best printed in color). Ask students to name five describing words for the left (clear) side of the photo; record on the board. Then ask students to give five describing words for the right (hazy) side of the photo. If “haze” is not named, add the word to the list. Ask students if they have ever experienced a “hazy day”; discuss how they felt or might feel on such a day. Explain that haze is a kind of air pollution, and more and more people are concerned about it; not only does it look bad, but it can actually make people sick. Tell students that they will be exploring how haze happens, what problems it causes, and what we can do about it.

Attachments for Step 2

Title: Photo **FileName:** [photo.doc](#)

Description: A photo of the Atlanta skyline taken on two different days (one smoggy and one clear). The photo can be shown as a transparency master or color copies can be passed out to students (the picture is best printed in color). Source: Georgia Department of Natural Resources, Environmental Protection Division, Air Protection Branch.

Step: 3 Duration: 5 minutes

Darken the classroom. Gently throw a handful of flour into the air, being careful to keep far enough away from the students. Shine a flashlight on the falling flour and ask students to describe what they see. Discuss how the flour floats in the air, separating into tiny pieces – like dust. Tell students that these tiny pieces are

called “particles.” Explain that many different kinds of particles float in the air and can be inhaled into the lungs, making people cough; indicate that this experiment was done far away from the students so that they would not breathe in the flour.

Step: 4 Duration: 10 minutes

Turn the lights back on. Blow air into a plastic sandwich bag and seal. Hold up for students to see, then circulate to show all of the students. Ask what is in there (likely response will be “air”), then ask if they think there are particles of anything in there. Explain that while the flour particles could be seen by our eyes, there are many, many particles in the air that cannot be seen. Ask a student to draw a circle on the board and tell students to pretend that the circle is a strand of hair cut open – a “cross section”; have the student label the diameter “70 microns.” Then ask two other students to draw two tiny circles inside the large circle and have them label their diameters “2.5 microns.” OR show “Particulate Diameters” poster (attached). Explain that microns are very, very small units of measurement. Indicate that particles in the air can be that teeny tiny – we can’t see them, but they are still there. When they mix with liquid droplets in the air, scientists call them a fancy name: particulate matter, or PM. Explain that scientists have found that when there are high amounts of particulate matter the air can look hazy – and people, especially those with sensitive lungs, can get sick. Tell them that they’re going to find out how that happens through the Cilia (not silly!) Game.

Attachments for Step 4

Title: Particulate Matter Diameters Poster **FileName:** [Particulate Diameters.doc](#)

Description: A poster with pictures comparing the diameter of a human hair and particulate matter. Source: EPA.

Step: 5 Duration: 5 minutes

In an open area, designate a trapezoid shape with cones (see Cilia Game Set-up, attached). (Note: Teacher background information on the role of cilia in the respiratory system can be found on the Web site attached.) Ask two students to be the Lungs. Then divide the rest of class into Particulates and Cilia, choosing a few more students to be Particulates than Cilia. (For additional reinforcement of the terms, give each student a pre-made nametag marked either “Cilia” or “Particulate” or “Lung”.) Have the Particulates line up along the longer edge of the area; have the Lungs stand on the short side of the trapezoid. Have the Cilia stand in between the Particulates and the Lungs, Ask students to take a deep breath and feel the air moving into their own lungs. Explain that Cilia are tiny little hair-like things that line the respiratory tract; their job is to keep all kinds of particles from entering the lungs by waving around. In the game, the Cilia can stretch and wave their arms, but they must stand still with feet together. Have Cilia practice. Place pre-made newspaper balls representing Particulate Matter

(PM) near each of the student Particulates. Explain that, on cue from you, the Particulates will throw the PM toward the Lungs, and the Cilia will try to defend the Lungs by waving their arms and batting the PM away from the Lungs. Demonstrate by being a Cilia and having a Particulate student throw one of the newspaper balls at you; emphasize that the newspaper balls should NOT be thrown with too much force or anywhere near the face.

Web Resources for Step 5

Title: Lungs and Respiratory System

URL: http://kidshealth.org/teen/your_body/body_basics/lungs.html

Annotation: Describes the role of cilia in the respiratory system. Provided as teacher background.

Attachments for Step 5

Title: Cilia Game Set-up **FileName:** [Cilia Game Set-Up.doc](#)

Description: A diagram showing positioning of students during Cilia Game.

Step: 6 Duration: 15 minutes

Begin the game by declaring the day bright and clear with little PM, and tell two or three students to throw the PM; the Cilia should be able to bat the PM away from the Lungs. Ask the Lungs how they're feeling. Declare another clear day, and have two or three other students throw the PM; again ask the Lungs how they are feeling. Then shout out "Hazy Day!" and tell all of the Particulates to throw the PM as fast as they can. When all of the newspaper balls have been thrown, stop the game and allow time for students to calm down. Then ask the Lungs to count how many PM's reached them; have the Lungs share how they feel to have all that "stuff" in them. Ask the Cilia to tell how they felt during the game.

Step: 7 Duration: 10 minutes

In the classroom, using the Health Problems Poster (attached) or any poster of the respiratory tract, review with students what happened in the Cilia Game. Ask the students if it would have been easier or harder on the Cilia if the PM had been much much smaller. Explain that those with sensitive lungs – children, the elderly, people with asthma and other respiratory problems – can be affected by particulate matter on hazy days.

Attachments for Step 7

Title: Ozone and Particulate Matter Health Problems Poster

FileName: [Health Problems Poster \(1\).doc](#)

Description: A poster by the EPA showing the human health problems that can result from respiration of particulate matter and ozone.

Step: 8 Duration: 30 minutes

Ask students if they have any questions about particulate matter and record on a flip chart. If they do not formulate the questions on their own, guide students to ask where particulate matter comes from, what can be done to reduce PM, and what can be done to protect their lungs from PM in the air now. Tell students that the Environmental Protection Agency – EPA – is a part of the government that watches over the environment in our country – land, water, and air. Tell them that EPA wants people to know about air pollution and they even have a website designed for kids. This Web site should answer many of their questions. Distribute a copy of the Particulate Matter Information Sheet (attached) to each student. Have students work in pairs to visit the EPA Air Quality Index for Kids Web site and search for the answers to the posted questions under the “Clean and Dirty Air” and “What Can I Do?” sections. Have each student record the questions and answers on the Particulate Matter Information Sheet. If any of the questions are unanswered, have some of the more proficient readers search EPA's Visibility Improvement Program Web site.

Web Resources for Step 8

Title: EPA's Visibility Improvement Program

URL: <http://www.epa.gov/air/visibility/index.html>

Annotation: This site describes visibility impairment caused by air pollution in the United States.

Title: EPA's Air Quality Index for Kids

URL: <http://www.epa.gov/airnow/aqikids>

Annotation: Designed for kids, this website contains information about clean and dirty air as well as air pollution and health. Cartoon characters introduce the topics. The site also includes a "What Can I Do?" section and games related to air quality issues.

Attachments for Step 8

Title: Particulate Matter Information Sheet **FileName:** [Particulate Matter Information Sheet.doc](#)

Description: A form for students to use to record answers found through Web site research. (Note: Attachment contains Web site address.)

Step: 9 Duration: 20 minutes

In a whole group, discuss the results of the Web search. When discussing where PM comes from, show students the Sources of Particulates Poster (attached). Ask them if they or their families ever create PM and how. Then ask what we can do to reduce PM. Record on flip chart; be sure that answers cover 6 basic areas: cleaner gas, cleaner cars, alternative fuel vehicles, alternate modes of transportation, less burning, controlling power plant pollution. Explain each (you might want to use the attached “Reducing Particulate Matter” sheet to guide you). Have students give examples of each category, and ask a student to quickly illustrate on the flip chart (this is so that students will have a visual clue to remember what each means). Discuss which of these the students or their families could work on to reduce PM, and star on the flip chart any that are mentioned. Finally have students share what they learned from their Web search regarding how to protect their lungs now, while we’re still working on solving the problem. If there are any unanswered questions, note them, and ask for volunteers to help you research the answers.

Attachments for Step 9

Title: Reducing Particulate Matter **FileName:** [Reducing Particulate Matter.doc](#)

Description: An information sheet for teacher background. Lists and explains six ways that particulate matter can be reduced.

Title: Sources of Particulates Poster **FileName:** [Sources of Particulates Poster.doc](#)

Description: A poster illustrating eight primary sources of particulate matter. (This poster is provided by the Georgia Environmental Protection Division, Air Protection Branch.)

Step: 10 Duration: 15 minutes + two to three days to complete assignment.
Explain to students that even though people see dirty skies on hazy days, most don’t really understand what air pollution is all about. Living things need clean air, and that’s why it’s so important to let others know about particulate matter and what we can do to reduce it. Tell the students that a fun way to explain things is through stories and art, and so they are going to create an illustrated environmental story called Hazy Days. Hand out the “Hazy Days Storybook Guidelines” and “Hazy Days Assessment Rubric” to each student and explain them. Emphasize that their job is to inform others about haze and particulate matter. Allow students to work on the story in class or as a homework assignment. If needed, help students bind the books. When complete, have students share their stories in class or with another class and/or display in the media center. If possible, have students read their stories to an adult group, such as a parent or PTA meeting.

Attachments for Step 10

Title: Hazy Days Assessment Rubric **FileName:** [Hazy Days Assessment Rubric.doc](#)

Description: A rubric to assess work on Hazy Days Storybook and synthesis of lesson content. Rubric is designed for student and teacher use.

Title: Hazy Days Storybook Guidelines **FileName:** [Hazy Days Storybook Guidelines.doc](#)

Description: A student hand-out with step-by-step guidelines for creating a Hazy Days Storybook. Contains specific expectations for evaluation.

Step: 11 Duration: Teacher Feedback

The Clean Air Campaign is pleased to provide standards-based air quality lesson plans for 4th through 8th grades. Please offer your feedback after implementing this lesson plan, as there is no substitute for real classroom experience. Send teacher name, school name and address, grade level, lesson name, comments or suggestions, and the number of students who completed the lesson to: schools@cleanaircampaign.com. Each teacher who responds will receive a Clean Air Campaign goody bag as a 'thank you.'

Materials and Equipment

1. Photo of the Atlanta skyline (attached). Make a transparency or color copies.
2. Handful of flour
3. Flashlight
4. Sandwich bag with seal
5. "Particulate Diameters" poster (attached) (optional)
6. 4 orange traffic/sports cones
7. Blank nametags (optional), one per student
8. 75 small newspaper "balls" (made by wadding up newspapers to size of a tennis ball and wrapping masking tape once around to hold the shape)
9. "Health Problems Poster" (attached) or any poster of the respiratory tract
10. "Particulate Matter Information Sheet" (attached), one per student
11. Large sheet of paper or poster board
12. Computer for each pair of students
13. Flip chart
14. Marker
15. "Sources of Particulate Matter" Poster (attached)
16. "Hazy Days Storybook Guidelines" handout (attached), one per student

17. "Hazy Days Assessment Rubric" (attached), one per student
18. Paper and markers for creating and illustrating stories

Total Duration

115 minutes plus two to three days to complete assignment

Technology Connection

Students will use a Web site to research answers to questions about particulate matter.

Assessment

The Hazy Days Storybooks will provide students an opportunity to synthesize what they have learned and share the information creatively. Use the rubric attached in step 10 to assess student storybooks.

Extension

Remediation

Accommodation

For students with exceptional needs, what changes can be made in instruction and teaching delivery to enhance student participation and learning? Each area below is a direct link to general classroom accommodations.

[Non-readers](#) [Physical Impairments](#) [Sensory Impairments](#)
[Attention/Behavior](#) [Gifted](#)

Each disability below is a direct link to general classroom accommodations specific for that disability.

[Autism](#)

[Deaf - Blind](#)

[Deaf/Hard of Hearing](#)

[Emotional and Behavioral Disorder](#)

[Mild Intellectual Disability](#)

[Orthopedic Impairment](#)

Other Health Impairments:

[Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder](#)

[Tourette Syndrome](#)

[Significant Development Delay](#)

[Specific Learning Disability](#)

[Speech - Language Impairment](#)

[Traumatic Brain Injury](#)

[Visual Impairment](#)

Modification

For students with significant disabilities, what changes can be made in instruction and teaching delivery to allow students to participate in classroom instruction while working on IEP objectives and off grade level GPS standards? Below are suggested modifications correlated to the procedures of this lesson plan.